



# Adjusted least squares estimator for algebraic hypersurface fitting

Konstantin Usevich, Ivan Markovsky

## ► To cite this version:

Konstantin Usevich, Ivan Markovsky. Adjusted least squares estimator for algebraic hypersurface fitting. SLA 2014 - 6th Conference on Structured Numerical Linear and Multilinear Algebra: Analysis, Algorithms and Applications, Sep 2014, Kalamata, Greece. hal-01066930

**HAL Id: hal-01066930**

**<https://hal.science/hal-01066930>**

Submitted on 17 Feb 2015

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Adjusted least squares estimator for algebraic hypersurface fitting

**K. Usevich<sup>a</sup>** and I. Markovsky<sup>b</sup>

(a) GIPSA-Lab, CNRS, UMR5216

BP.46, 38402 St.Martin d'Hères cedex, France.

(b) Department ELEC, Vrije Universiteit Brussel

Pleinlaan 2, 1050 Brussel, Belgium.

`konstantin.usevich@gipsa-lab.grenoble-inp.fr, imarkovs@vub.ac.be`

We consider the problem of fitting a set of points in Euclidean space by an algebraic hypersurface. We assume that the points on a “true” hypersurface are corrupted by Gaussian noise, and we estimate the coefficients of the “true” polynomial equation. The adjusted least squares estimator accounts for the bias present in the ordinary least squares estimator. The adjusted least squares estimator is based on constructing a quasi-Hankel matrix, which is a bias-corrected matrix of moments. For the case of unknown noise variance, the estimator is defined as a solution of a polynomial eigenvalue problem. In this talk, we present new results on invariance properties of the adjusted least squares estimator and an improved algorithm for computing the estimator for arbitrary set of monomials in the polynomial equation.

## References

- [1] A. Kukush, I. Markovsky, and S. Van Huffel (2004). Consistent estimation in an implicit quadratic measurement error model. *Comput. Statist. Data Anal.*, 47(1):123-147.
- [2] I. Markovsky (2012). *Low Rank Approximation: Algorithms, Implementation, Applications*. Communications and Control Engineering. Springer.